

EXHIBIT 10

1 UNITED STATES DISTRICT COURT
2 SOUTHERN DISTRICT OF NEW YORK
3 CASE NO. 1:13-cv-07789-LGS
4

5
6 IN RE FOREIGN EXCHANGE BENCHMARK RATES
7 ANTITRUST LITIGATION
8

9
10 VIDEOTAPED DEPOSITION OF
11 GEIR HØIDAL BJØNNES
12

13 *** CONFIDENTIAL ***

14 September 21, 2018

15 9:47 a.m.
16

17 CAHILL GORDON & REINDEL LLP
18 80 Pine Street
19 New York, New York
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22
23 Sharon Lengel, RMR, CRR
24
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<p style="text-align: right;">Page 98</p> <p>1 Q. I'm on page 16.</p> <p>2 A. But I'm -- okay. I can -- I may</p> <p>3 focus on page 16. But there is nothing</p> <p>4 about the factors there, as far as I can</p> <p>5 see.</p> <p>6 Q. Just -- yeah. Just the</p> <p>7 beginning of the section that talks about</p> <p>8 the factors. But yeah. They're --</p> <p>9 certainly in the pages that follow,</p> <p>10 there's a much more detailed description</p> <p>11 of the factors.</p> <p>12 So if you turn to</p> <p>13 paragraph 68 --</p> <p>14 A. Sorry? 68?</p> <p>15 Q. Paragraph 68.</p> <p>16 A. Okay.</p> <p>17 Q. You identify certain groups of</p> <p>18 these factors, which include</p> <p>19 dealer-specific factors, which is</p> <p>20 paragraph 68, market-specific factors in</p> <p>21 paragraph 69, and customer-specific</p> <p>22 factors in paragraph 70; is that right?</p> <p>23 A. You mean 70. Yes? That's</p> <p>24 correct.</p> <p>25 Q. Yes. And do you remember how</p>	<p style="text-align: right;">Page 100</p> <p>1 A. We have reviewed the literature</p> <p>2 in order to come up with these factors.</p> <p>3 Q. Okay. Do you remember which</p> <p>4 literature? I mean --</p> <p>5 A. The foreign exchange market</p> <p>6 microstructure literature.</p> <p>7 Q. Any specific articles or books?</p> <p>8 A. As you can see here, it's</p> <p>9 referred to, among others, one of my</p> <p>10 articles. It's also -- it's also selected</p> <p>11 from standard well-known articles in the</p> <p>12 field of FX market microstructure. So --</p> <p>13 Q. Okay. But you list a lot of</p> <p>14 stuff here.</p> <p>15 Was there any one in</p> <p>16 particular -- one or two that you found</p> <p>17 especially helpful?</p> <p>18 A. As mentioned, a lot of</p> <p>19 documentation for this you can find in one</p> <p>20 of my 2017 articles. Most of these or all</p> <p>21 of these factors are also established in</p> <p>22 the FX market micro literature. So these</p> <p>23 factors show up in many studies.</p> <p>24 Q. Okay. Okay. So first let's</p> <p>25 walk through the dealer-specific factors</p>
<p style="text-align: right;">Page 99</p> <p>1 you selected these factors?</p> <p>2 A. Yes. I remember how these</p> <p>3 factors were selected. They are selected</p> <p>4 from the FX market microstructure</p> <p>5 literature.</p> <p>6 Q. Okay. And what expertise do you</p> <p>7 have that permitted you to identify these</p> <p>8 factors?</p> <p>9 A. As mentioned, I am working in</p> <p>10 the field of FX market microstructure.</p> <p>11 And I have also been doing work related</p> <p>12 with some of these factors, as you may</p> <p>13 know.</p> <p>14 Q. Did you consult with anyone else</p> <p>15 to put together this list of factors?</p> <p>16 A. This is something that Alexander</p> <p>17 and I were collaborating on.</p> <p>18 Q. Okay.</p> <p>19 A. We tried to do our best in order</p> <p>20 to identify the factors suggested in the</p> <p>21 literature.</p> <p>22 Q. So these are factors just based</p> <p>23 on your review of literature. You didn't</p> <p>24 interview any FX traders or do any</p> <p>25 realtime --</p>	<p style="text-align: right;">Page 101</p> <p>1 at paragraph 68.</p> <p>2 A. Okay.</p> <p>3 Q. So first, you identify order</p> <p>4 flow information. It's actually a little</p> <p>5 before 68. I'm sorry. 65, 66.</p> <p>6 You talk about order flow</p> <p>7 information as one of the factors that</p> <p>8 influences spreads in FX spot markets; is</p> <p>9 that right?</p> <p>10 A. FX order flow is regarded as a</p> <p>11 very important parameter among -- or in</p> <p>12 the literature. There are several</p> <p>13 publications using that factor. For</p> <p>14 instance, Rich Lyons, which I also know he</p> <p>15 has several articles marked in evidence;</p> <p>16 earlier studies by me, Dagfinn Rime, and</p> <p>17 many, many other authors in the FX market</p> <p>18 microstructure literature.</p> <p>19 So actually, this has been -- in</p> <p>20 the market -- FX market micro literature,</p> <p>21 and even in the literature on stock</p> <p>22 exchanges and so on, the concept of order</p> <p>23 flow is regarded as a very important one.</p> <p>24 Q. Okay. And what do you mean by</p> <p>25 "order flow information"?</p>

<p style="text-align: right;">Page 114</p> <p>1 Q. Okay. So how does your model 2 take account of this factor? 3 A. Then we have to go to Appendix D 4 again. 5 Q. Okay. 6 A. Okay. Thank you. Sorry. I 7 forgot the factor. Which factor was it? 8 Q. We were doing customer trading 9 activity. 10 A. Yeah. Client trading frequency. 11 Q. Okay. 12 A. You can see that that factor is 13 defined the following way: The fraction 14 of days this year that this client traded 15 with this bank. 16 Q. Okay. And now we can look at -- 17 customer sophistication is next in 18 paragraph 70. 19 Can you -- is that right? 20 A. That's probably correct. 21 Q. Can you explain what customer 22 sophistication is. 23 A. Yes, I can. If we go back to 24 Appendix D, client sophistication is 25 defined as the fraction of this client's</p>	<p style="text-align: right;">Page 116</p> <p>1 spreads. 2 Q. Okay. Next is customer 3 informedness in paragraph 70. 4 A. Yeah. 5 Q. So you note that the customer's 6 likelihood of being informed. 7 A. That's correct. That is defined 8 on page 2, I guess, in the appendix. I 9 think we call it -- no. It's on page 1. 10 It's just the client's trade-size-weighted 11 average return when trading with this bank 12 this year measured as the midpoint to 13 midpoint return over the 60 seconds after 14 the trade using top-of-the-book data from 15 EBS/Reuters. 16 Q. And how does that affect 17 spreads? 18 A. Well, it may affect spreads in 19 different ways. Of course, if this -- if 20 this -- if, for instance, a good 21 performance by the -- is because -- 22 because of low latency trading, such as 23 some high-frequency traders are doing, 24 then you may want to increase spreads. 25 There may be some very few occasions where</p>
<p style="text-align: right;">Page 115</p> <p>1 trades with this bank this year that 2 derive the multi-bank trading platforms. 3 Q. Can you explain in laymen's 4 terms what you understand it to mean? 5 A. What it is? 6 Q. What -- 7 A. It's just the percentage -- it's 8 just the fraction of the trades a 9 particular customer has been doing on the 10 multi-bank platforms. 11 Q. Okay. And why is that a measure 12 of sophistication? 13 A. Well, because more sophisticated 14 customers -- that's customers that have -- 15 know more about the markets that tend to 16 use such platforms. 17 Q. Okay. 18 A. So non-sophisticated clients 19 will not use those platforms. 20 Q. And how does customer 21 sophistication affect spreads? 22 A. Ex-Ante would expect -- 23 according to the literature, Ex-Ante would 24 expect that they would obtain slightly 25 better spreads or slightly smaller</p>	<p style="text-align: right;">Page 117</p> <p>1 you think you might learn something about 2 trading by some clients where you would 3 offer slightly more favorable terms. 4 Q. Okay. Okay. So we've discussed 5 the various factors outlined in your 6 report. 7 Did we skip over any? 8 A. What did you say? Sorry? 9 Q. Did we skip any factors that you 10 think are important to FX spreads? 11 A. We have tried to do our best to 12 capture the factors mentioned in the 13 market microstructure literature -- FX 14 market microstructure literature. 15 Q. I mean in our discussion today, 16 do you feel that we've addressed all of 17 the major factors that you've identified 18 in your report? 19 A. There are more factors here, as 20 you can see in the appendix. I am happy 21 to go through all of them if you want to. 22 Q. Right. These are variables used 23 in your regressions. And then I think 24 here in this section, you've listed out 25 "We have been trying to address the</p>

<p style="text-align: right;">Page 134</p> <p>1 data.</p> <p>2 Q. Okay.</p> <p>3 A. So we have a better measure for</p> <p>4 it, I think.</p> <p>5 Q. Would the trader's view on the</p> <p>6 likely direction of the market affect the</p> <p>7 spread?</p> <p>8 A. Can you repeat that question?</p> <p>9 Q. Sure. Would a trader's view on</p> <p>10 the likely direction of the market affect</p> <p>11 the spread?</p> <p>12 A. In which setting do you mean?</p> <p>13 Q. Everything we're talking about</p> <p>14 today is foreign exchange.</p> <p>15 A. May or may not. It's hard to</p> <p>16 give a clear answer on that.</p> <p>17 Q. In what situation would it not?</p> <p>18 A. It depends on, you know -- it --</p> <p>19 I don't really understand what you want.</p> <p>20 Can you --</p> <p>21 Q. If a trader has a view on</p> <p>22 the likely direction the market is moving,</p> <p>23 does that affect spreads?</p> <p>24 A. If -- you know, if -- if the</p> <p>25 dealer, because of that, wants to adjust</p>	<p style="text-align: right;">Page 136</p> <p>1 information?</p> <p>2 A. Occasionally, it may. But</p> <p>3 it's -- this is something that's not</p> <p>4 common to -- there are no common variables</p> <p>5 in the market microstructure on FX.</p> <p>6 Q. Okay. And does your model</p> <p>7 account for that factor?</p> <p>8 A. Which factor are you --</p> <p>9 Q. These trader-specific factors,</p> <p>10 like risk limits, intraday losses.</p> <p>11 A. I think it's likely, of course,</p> <p>12 that they are related with some other</p> <p>13 variables that it could be -- that kind of</p> <p>14 things could be correlated with -- for</p> <p>15 instance, with volatility.</p> <p>16 Q. So an individual trader's risk</p> <p>17 limit or measurement of his own book for</p> <p>18 losses would be linked to volatility?</p> <p>19 A. Have you finished your question?</p> <p>20 Q. Yeah.</p> <p>21 A. Of course, with more volatility,</p> <p>22 it's more likely that there are bigger</p> <p>23 changes. So --</p> <p>24 Q. Sorry. You just said with</p> <p>25 volatility, it's more likely that there</p>
<p style="text-align: right;">Page 135</p> <p>1 his inventories rates, of course, he can</p> <p>2 try to adjust prices a little bit.</p> <p>3 Q. Okay. And does your model take</p> <p>4 account of a trader's view of the likely</p> <p>5 direction of the market?</p> <p>6 A. As mentioned, we have -- we have</p> <p>7 the order flow measure in there. So --</p> <p>8 Q. And that -- and you're saying</p> <p>9 that measuring the volume of trades coming</p> <p>10 in and out is the same as understanding a</p> <p>11 trader's view of the likely direction of</p> <p>12 the market?</p> <p>13 A. Could be, yes. It's, of course,</p> <p>14 impossible to measure exactly the view of</p> <p>15 a dealer at a particular time. I don't</p> <p>16 really know how you want to measure that.</p> <p>17 It's not easy.</p> <p>18 Q. What about other trader-specific</p> <p>19 factors, like risk limits, intraday</p> <p>20 losses? How would factors like this</p> <p>21 affect trader's risk tolerance in quoted</p> <p>22 spreads?</p> <p>23 A. I think you refer to information</p> <p>24 that is very hard to obtain.</p> <p>25 Q. Would that affect spreads, that</p>	<p style="text-align: right;">Page 137</p> <p>1 are bigger changes?</p> <p>2 A. If -- of course, with bigger</p> <p>3 volatility, the risk of both making money</p> <p>4 or losing money increases.</p> <p>5 Q. Right. But that factor would</p> <p>6 not consider a trader's individual issues.</p> <p>7 It's a market factor; right?</p> <p>8 A. But it could be correlated. So</p> <p>9 we have used -- we have used the variables</p> <p>10 that we have a motivation for in the FX</p> <p>11 market microstructure literature. And</p> <p>12 those variables, of course, have to be</p> <p>13 possible to estimate, which is also common</p> <p>14 for the rest of the FX market</p> <p>15 microstructure literature, of course. So</p> <p>16 variables that are not possible to</p> <p>17 calculate will not be included in the</p> <p>18 analysis.</p> <p>19 Q. Do you know whether negotiations</p> <p>20 ever take place between FX traders at a</p> <p>21 particular dealer or salespeople and</p> <p>22 clients either on a trade-by-trade basis</p> <p>23 or on a client relationship basis?</p> <p>24 A. Many details in that sentence.</p> <p>25 Can you please split it up a little bit?</p>

<p style="text-align: right;">Page 138</p> <p>1 Q. Sure. We can go through it 2 again. 3 So are you aware of any 4 negotiations that take place between FX 5 traders at a particular dealer and 6 salespeople and clients about -- on a 7 trade-by-trade basis or on a client 8 relationship basis? 9 A. That's something we have not 10 looked into in our analysis. 11 Q. Okay. Do you think that 12 negotiations like that could affect the 13 spread a client is quoted? 14 A. I don't really see how that 15 matters in our analysis. 16 Q. Why? 17 A. We have included the variables 18 that we think should be relevant in the 19 clean -- for FX trading. So that's why. 20 Q. Okay. Do you know whether FX 21 salespeople sometimes have the discretion 22 to mark up a price quoted by a trader? 23 A. This is -- this is something we 24 have not been asked to investigate. 25 Q. Okay. Did class counsel</p>	<p style="text-align: right;">Page 140</p> <p>1 affect the spread that a trader of that 2 bank would be willing to quote? 3 A. So I guess what you are -- right 4 now, again, this is a little bit back to 5 where we started today. Of course, this 6 is through sharing sensitive common 7 information about spreads, about order 8 flows, et cetera. For instance, stop loss 9 orders, take profit loss orders. That 10 might be relevant information for that. 11 So that could be a result of the 12 conspiracy. 13 Q. What could be a result of the 14 conspiracy? 15 A. So what I think you suggested 16 now was that because the defendant banks 17 were sharing information, sensitive 18 competitive information on spreads, on 19 order flows, on price contingent orders, 20 such as take profit, stop losses, that 21 kind of sensitive competitive information, 22 if that is shared, of course, some dealers 23 may be able to expect order flows. 24 Q. Are you offering an opinion on 25 whether particular information sharing is</p>
<p style="text-align: right;">Page 139</p> <p>1 instruct you to investigate the other 2 factors that you outlined in your report? 3 A. The factors are based on the FX 4 market microstructure literature, and that 5 has been Alexander and my job to identify 6 those -- 7 Q. Okay. 8 A. --- variables. 9 Q. And so one of those variables 10 was not the potential for a salesperson to 11 mark up a price. 12 A. I don't think such a variable is 13 possible to measure, to be honest. 14 Q. Okay. Would that variable 15 affect the spreads? 16 A. It's nothing I have any answer 17 to. It's -- 18 Q. Okay. Do you know -- 19 A. As mentioned, again, we have -- 20 we have included those variables that are 21 identified in the FX market micro 22 literature. So we have done our best to 23 identify those variables. 24 Q. Do you know whether anticipated 25 customer flow at a given dealer bank could</p>	<p style="text-align: right;">Page 141</p> <p>1 legitimate or illegitimate? 2 A. We have not been asked to do an 3 analysis on that. 4 Q. Okay. So in your -- in the 5 capacity of your expertise, do you know 6 whether a customer -- anticipated customer 7 trade flow would have an effect on 8 spreads? 9 A. As mentioned, we have not been 10 doing an analysis on that. 11 Q. Okay. Do you know whether a 12 trader's perception of market risk could 13 affect the trade? 14 A. Affect the trade in what sense? 15 Q. Whether his sense of the risk of 16 the market could affect the spread that 17 he's offering. 18 A. Exactly. If uncertainty is 19 increasing, expected uncertainty, for 20 instance, then spreads will go up -- will 21 go out, as we discussed when we were going 22 through the variables. 23 Q. Right. But here it's a little 24 bit more nuanced. It's the trader's 25 perception of that market risk.</p>

<p style="text-align: right;">Page 150</p> <p>1 So other than frequency of 2 trades placed with the bank, does your 3 model account for relationships that might 4 exist between a client and the trader, 5 salesperson, or bank? 6 Other than that frequency 7 variable, is there anything else? 8 A. This is the type of variable 9 that is possible to measure and that we've 10 captured such effects. It's impossible 11 to -- you see, we cannot really -- we 12 cannot really analyze each and every 13 trader. I don't know how -- it's 14 impossible to calculate such a variable. 15 Q. Okay. 16 A. And that's also reflected in the 17 literature. Nobody uses that kind of 18 factors, because they are not -- it's not 19 possible to measure them. 20 Q. Okay. Did you consider 21 potential synergies with other relevant 22 business lines? For example, if there's 23 an important client to the bank for other 24 reasons or that has a relationship with 25 other branches or business lines, could</p>	<p style="text-align: right;">Page 152</p> <p>1 for trading certain currencies? 2 A. Can you repeat that again? 3 Q. At each bank, is there usually a 4 specific trader responsible for trading 5 certain currencies? 6 A. Typically, no trader -- no 7 dealer will handle all currencies at all 8 times. So they may handle some 9 currencies. If you are dealing in big 10 currencies, you may have one. If you are 11 dealing in small currencies, you may have 12 more. 13 Q. And do you think that an 14 individual trader's specialization would 15 affect spreads? 16 A. In what sense are you suggesting 17 that it would -- 18 Q. Well, I'm asking you if a 19 trader's specialization in currencies 20 would affect quoted spreads. 21 A. And that kind of information is 22 captured by our common factors. 23 Q. Which factor would that be 24 captured in? 25 A. Then I think I would have to go</p>
<p style="text-align: right;">Page 151</p> <p>1 that affect spreads too, or is that just 2 another thing that's difficult to measure? 3 A. It's certainly difficult to 4 measure. But as mentioned a few times, we 5 have included those variables that is 6 related -- that is regarded as relevant in 7 the literature of FX market 8 microstructure. 9 Q. Okay. Okay. To your knowledge, 10 do traders at a specific bank ever 11 specialize in one or more currencies or 12 currency pairs? 13 A. Can you repeat that, please? 14 Q. Do traders specialize in 15 currency pairs, in your experience? 16 A. Are you talking about human 17 dealers? 18 Q. Yes. 19 A. Of course, they cannot handle 20 every currency pair. 21 Q. So -- 22 A. You know, so there will be some 23 specialization, of course. 24 Q. Okay. And is there usually at 25 each bank an individual trader responsible</p>	<p style="text-align: right;">Page 153</p> <p>1 through all of them, actually. 2 Q. For an individual trader's 3 specialization in currencies? 4 A. Of course. If you are -- if you 5 are a currency dealer, you would have 6 to -- you would typically take into 7 account these client-specific factors. 8 You would take into account market-wide 9 factors. Of course, you would typically 10 provide different prices for different 11 spreads for -- let's say if you are 12 trading in Swedish Kroner/Euro, for 13 instance, you would typically provide 14 other quotes for 5 Euro, 5 million Euro 15 than for 300 million Euro. So then size 16 factor will matter. For instance, if the 17 market is volatile at that time, maybe you 18 would have to increase the spread a little 19 bit further. And, yeah, you could also go 20 through other -- you could be -- VIX index 21 could matter. 22 Q. But it's safe to say a trader 23 who specializes in a particular currency 24 pair would have a certain familiarity with 25 the ups and down of that currency pair, is</p>

<p style="text-align: right;">Page 158</p> <p>1 trade or executed on electronic trading 2 platform may be considered an operating 3 cost factor. 4 A. Yes. That's correct. 5 Q. Okay. 6 A. It's because -- I can tell you 7 why, since you asked about it. When you 8 are trading, doing a voice trade, it means 9 that there is a person sitting in the 10 other end. So a bank used up dealer time. 11 And that means that you have some -- so of 12 course, that time will cost some money. 13 And that has to be incorporated into the 14 spread. 15 On the other hand, when doing an 16 electronic trade, everything is automatic. 17 So there is actually no human involvement 18 in that trade. That means that you have 19 lower costs, and that's something that 20 will be reflected in the spreads. 21 So, for instance, if there is a 22 trade for a small amount, let's say that a 23 human dealer spends 10 minutes or 15 24 minutes, that would have to be reflected 25 in a wider spread, for instance, compared</p>	<p style="text-align: right;">Page 160</p> <p>1 platforms. Those spreads will typically 2 also reflect these common factors. In 3 addition to that, they may also regard 4 factors such as the customer-specific 5 factors and also, to some extent, many 6 inventory considerations and so on. 7 Actually, banks that spend effort on doing 8 customer profiling and the relevant input 9 into those models are reflected by our 10 common factors. 11 Q. Is it correct that spreads on 12 electronic trades on single-dealer 13 electronic trading platforms are set by 14 algorithms? 15 A. They are -- they are typically 16 set by algorithms. 17 Q. What about for multi-dealer 18 trading platforms? 19 A. Also typically set by 20 algorithms. 21 Q. So do voice traders set spreads 22 on single-dealer platforms? 23 A. A voice dealer? It's -- 24 actually, do you know the difference 25 between electronic and voice? Electronic,</p>
<p style="text-align: right;">Page 159</p> <p>1 to if the same client had done the same 2 deal on an electronic platform. 3 Q. Okay. And is it correct you -- 4 I think you write a little bit further in 5 paragraph 72 that there is greater price 6 transparency on electronic platforms; is 7 that right? 8 A. On some platforms, yes. 9 Q. Okay. So can you explain how 10 spreads are set on electronic trades on 11 single-dealer electronic trading 12 platforms? 13 A. How they are set? Well, I have 14 some experience in that. And typically, 15 it's -- I would say that the common 16 factors that is presented in this appendix 17 are typically among those factors that 18 will be used to create those spreads. So 19 typically, they start with -- they start 20 with using reference prices, reference bid 21 and ask, which typically are derived from 22 ECNs. 23 For instance, during this 24 period, maybe EBS, Reuters, or typically 25 EBS and Reuters, maybe also some other</p>	<p style="text-align: right;">Page 161</p> <p>1 typically, it's just a human dealer 2 typically will use this kind of input when 3 providing prices. It's not much different 4 on electronic platforms. Also the prices 5 there will be -- will be made up by 6 similar type of variables. 7 Q. But the trades -- but the quotes 8 in electronic system would be set by 9 algorithm, not by a voice trader; is that 10 right? 11 A. Of course, in the electronic 12 system, it will be set by an algorithm. 13 And the algorithm will be -- will be made 14 by humans. 15 Q. Okay. Speaking generally, are 16 there any characteristic differences 17 between an electronic trade and a voice 18 trade? 19 A. Can you repeat that, please? 20 Q. Are there any general 21 differences between an electronic trade 22 and a voice trade? 23 A. In which respect are you -- 24 Q. Any characteristics about the 25 essence of the trade, how it's traded, the</p>

<p style="text-align: right;">Page 162</p> <p>1 spreads quoted?</p> <p>2 A. You have different versions of</p> <p>3 electronic platforms. So some -- some</p> <p>4 type of those platforms, it's just</p> <p>5 electronic version of voice. But you also</p> <p>6 may have other versions of electronic</p> <p>7 platforms.</p> <p>8 Q. When a dealer knows the identity</p> <p>9 of the counterparty it is trading with, is</p> <p>10 it true that it may be able to offer a</p> <p>11 tighter spread if it is less concerned</p> <p>12 about toxic order flow?</p> <p>13 A. If -- toxic -- if -- in the</p> <p>14 sense that that order flow, for instance,</p> <p>15 from a high frequency hedge fund or</p> <p>16 something --</p> <p>17 Q. Exactly.</p> <p>18 A. Of course, if you risk losing</p> <p>19 money from trading with some particular</p> <p>20 counterparty, you -- you would set a</p> <p>21 higher spread than if you did not face</p> <p>22 that risk.</p> <p>23 Q. Do you know whether dealers</p> <p>24 always know the identity of the</p> <p>25 counterparty when trading through</p>	<p style="text-align: right;">Page 164</p> <p>1 toxic order flow.</p> <p>2 What would be the difference in</p> <p>3 spreads?</p> <p>4 A. It's -- it's hard to tell</p> <p>5 upfront. You know, we have all these</p> <p>6 common factors that may be relevant in</p> <p>7 that respect.</p> <p>8 Q. So you don't think the spread</p> <p>9 would be wider for the toxic flow?</p> <p>10 A. It all depends.</p> <p>11 Q. Okay.</p> <p>12 A. I cannot make general</p> <p>13 predictions, because there are many</p> <p>14 different factors that may play a role.</p> <p>15 Q. Does your model consider</p> <p>16 differences in information about</p> <p>17 counterparty identity at the time of</p> <p>18 quote?</p> <p>19 A. Can you repeat that?</p> <p>20 Q. Does your model consider</p> <p>21 information about counterparty identity at</p> <p>22 time of quote?</p> <p>23 A. In electronic trade, you mean,</p> <p>24 or voice trade, for instance?</p> <p>25 Q. In electronic trading.</p>
<p style="text-align: right;">Page 163</p> <p>1 electronic channels?</p> <p>2 A. They do not -- they -- sometimes</p> <p>3 no. But there are also occasions where</p> <p>4 they do not know.</p> <p>5 Q. Okay. Is it right that EBS and</p> <p>6 Reuters are anonymous platforms?</p> <p>7 A. That's correct. EBS and Reuters</p> <p>8 are anonymous platforms where the</p> <p>9 participant submits limit orders.</p> <p>10 Q. Okay. Imagine that a bank is</p> <p>11 asked to provide a Euro/U.S. Dollar quote</p> <p>12 to a counterparty that does not bring</p> <p>13 toxic order flow and a Euro/U.S. Dollar</p> <p>14 quote for the same amount to an unknown</p> <p>15 counterparty that may or may not tend to</p> <p>16 generate toxic order flow.</p> <p>17 Which quote would be wider,</p> <p>18 other things being equal?</p> <p>19 A. Can you repeat that, please?</p> <p>20 Q. Right. We have the same -- same</p> <p>21 request, same currency pair, one set going</p> <p>22 to someone who we know is associated with</p> <p>23 toxic order flow or may be associated with</p> <p>24 toxic order flow and the other going to</p> <p>25 someone who we know is not associated with</p>	<p style="text-align: right;">Page 165</p> <p>1 A. It may take into account aspects</p> <p>2 of the client. That's correct.</p> <p>3 Q. And what variables cover</p> <p>4 counterparty identity?</p> <p>5 A. Well, I can go through the list</p> <p>6 again.</p> <p>7 Q. Okay. Please do.</p> <p>8 A. For instance, let's talk about</p> <p>9 the single-bank trade or a single-bank</p> <p>10 platform. Okay? Customer profiling by</p> <p>11 banks typically would include some measure</p> <p>12 of client sophistication. It's the first</p> <p>13 variable.</p> <p>14 Q. Customer profiling. Client</p> <p>15 sophistication. Okay.</p> <p>16 A. They would also include some</p> <p>17 element of toxicity, for instance, to</p> <p>18 protect themselves against high-frequency</p> <p>19 traders.</p> <p>20 Q. So your client sophistication</p> <p>21 variable is the fraction of client trades</p> <p>22 with this bank this year that arrives via</p> <p>23 multi-bank trading platforms.</p> <p>24 A. Exactly.</p> <p>25 Q. So that will consider --</p>

<p style="text-align: right;">Page 218</p> <p>1 Q. Okay. And just so I'm 2 understanding, it's a standard methodology 3 for estimating impact and for estimating 4 damages; right? 5 A. It's -- you can use that kind of 6 analysis for different purposes. And this 7 is certainly one of the purposes you can 8 use it for. That's correct. 9 Q. Okay. 10 A. So it's -- actually, this is a 11 methodology that is commonly used among -- 12 also fund -- those handling funds and so 13 on, we can use it -- for instance, fund 14 managers can use it for estimating their 15 costs. It could be other -- several other 16 ways to do it. So it's a quite common 17 methodology. 18 Q. Okay. 19 A. So the references are in there. 20 So -- 21 Q. Okay. Okay. So if we can turn 22 to Appendix E of your report. 23 A. E? 24 Q. Yes. 25 A. Okay.</p>	<p style="text-align: right;">Page 220</p> <p>1 squared of zero percent mean? 2 A. Zero would mean that you are not 3 explaining the variance. 4 Q. Okay. And what would an R 5 squared of 100 percent mean? 6 A. I hope we never find that, 7 because it means that you are doing 8 something wrong, I guess. 9 Q. But it would mean -- and you 10 mean that because you can't possibly 11 explain everything. 12 A. It's impossible. 13 Q. Okay. But that is what -- 14 A. Then you don't need to run a 15 regression. 16 Q. In an ideal world, it's -- 17 100 percent means you've explained every 18 single thing; is that right? 19 A. Then you don't need to run a 20 regression. 21 Q. Okay. So if you could again 22 just explain in laymen's terms here on 23 page 4 of Appendix E, there is an R 24 squared of .4 percent; is that right? 25 A. Yeah. See, it differs a little</p>
<p style="text-align: right;">Page 219</p> <p>1 Q. And, again, I'm going to have to 2 ask you for some assistance with -- 3 A. I'm willing to provide some 4 assistance. No problem. 5 Q. -- the economics of this. 6 A. Yeah. 7 Q. Okay. Are you familiar with the 8 term "R squared"? 9 A. I am. 10 Q. Okay. And what is R squared? 11 A. That's a measure that you 12 frequently use in some regressions, which 13 explains -- explained variance. 14 Q. Okay. 15 A. In predicted regressions, we 16 typically use another measure, which is 17 RMSE, root-mean-square error. 18 Q. Okay. And in laymen's terms, 19 please, what does the R squared tell you 20 about the fit or precision of your model? 21 A. It's typically, as mentioned, a 22 measure that you use for another type of 23 regressions. But it's a measure of 24 explained variance. 25 Q. Okay. So what would an R</p>	<p style="text-align: right;">Page 221</p> <p>1 bit from 0.4, 11 percent. 2 Q. Right. 3 A. 10. It's the usual experience 4 in this type of regressions. I have some 5 similar experiences from other datasets as 6 well. 7 Q. Okay. But can you just explain 8 to me what that means, again, as a 9 non-economist? 10 A. It explains that it's hard to 11 explain a large proposition, of course, so 12 uncertainty. 13 Q. Okay. 14 A. Which is not unexpected, of 15 course. 16 Q. Okay. Right. 17 Okay. If we can turn back to 18 paragraph 25. I'm looking at the last 19 paragraph of 25 on page 7. 20 A. 25. Okay. I guess I should -- 21 Q. You can start, of course. 22 Please read the whole paragraph. 23 A. I think I should read the whole 24 paragraph. 25 Q. Yes, of course.</p>

<p style="text-align: right;">Page 222</p> <p>1 A. (Witness perusing document.) 2 Yeah. That's correct. 3 Q. Okay. So I'm just -- I'm 4 looking at the second half where you start 5 "Conducting this clean period analysis, 6 our working model shows that there are 7 identifiable common factors that influence 8 pricing in the FX market in a 9 statistically significant fashion and that 10 the conspiracy resulted in statistically 11 significant increases in FX spreads, the 12 difference between bid and ask, buy and 13 sell prices for FX transactions during the 14 class period." 15 So I just want to understand 16 what you mean by "statistically 17 significant." 18 What is the test you used to 19 establish the statistical significance of 20 these factors? 21 A. This is a standard -- I think we 22 should go to the appendix, and I can 23 explain to you. It's Appendix F; right? 24 No. E. 25 Q. D, I think.</p>	<p style="text-align: right;">Page 224</p> <p>1 Q. Got it. 2 A. Yeah. So this is just pure 3 standard statistics. 4 Q. So this is just -- so when you 5 say that, you're just talking about the T 6 statistic. 7 A. Exactly. 8 Q. Okay. And then when you say the 9 conspiracy resulted in statistically 10 significant increases in FX spreads -- 11 A. That's another. That's another 12 issue. 13 Q. Okay. 14 A. That's not captured directed by 15 the -- 16 Q. Okay. 17 A. So that's our damage estimates, 18 which we have a bottom-up approach, as 19 described in our document or paper. 20 Q. Okay. 21 A. And so for each and every trade, 22 we have an estimate of the damage, and we 23 can aggregate that up to -- for instance, 24 up to the class-wide level. So we have a 25 common -- we have a common model for how</p>
<p style="text-align: right;">Page 223</p> <p>1 A. Okay. So statistically 2 significant is statistically -- a concept, 3 which is basically used in all 4 regressions. So in our case, we have -- 5 all methodology suggests that we should 6 use the so-called T values. Okay. Sorry. 7 Q. No. I'm sorry. You can go 8 ahead. 9 A. Yeah. 10 Q. Thank you. 11 A. Statistically significant, that 12 has to do with the standard error of the 13 coefficients. 14 Q. Okay. 15 A. And if you look at the T values. 16 Can you see the T values? 17 Q. Yes. 18 A. In the right column? A 19 coefficient is statistically significant 20 or statistically reliable if that one is 21 bigger or smaller than two minus two. In 22 that case, it's statistically significant 23 at 95 percent level. The higher, the more 24 statistically significant it is. That's 25 the --</p>	<p style="text-align: right;">Page 225</p> <p>1 to calculate damage for each trade, each 2 customer, class-wide level. 3 Q. Got it. 4 A. And looking at those estimates, 5 they are also highly statistically 6 significant. That's -- that's the content 7 of that sentence. 8 Q. I see. Okay. Okay. 9 And just so I understand -- 10 again, forgive my ignorance of statistics. 11 So the T statistics are high, and that's 12 why you're calling them statistically 13 significant. And then -- but when you 14 look at it in combination with the R 15 squared, it's saying that it's 16 statistically significant but for 17 explaining less than one percent of the 18 variance; is that right? 19 A. That particular regression 20 explains a small percentage of the 21 variance. 22 Q. Okay. 23 A. This is very -- if you have 24 looked at other, you know, similar kind of 25 regressions, you would recognize that</p>

<p style="text-align: right;">Page 314</p> <p>1 A. That's -- you know, that's just 2 how the market works. 3 Q. Got it. Got it. 4 Okay. I'm going to move on to a 5 different topic. Talk a little bit about 6 FX benchmark fixes. 7 Can you tell me how many 8 different FX benchmark fixes occurred 9 during the class period? 10 A. I know that you raised that 11 question at the beginning of today's 12 session. I do not know exactly the number 13 of benchmark fixes. Actually, there are 14 quite a few out there. 15 Q. Okay. Do you have, like, an 16 estimate? Is it -- 17 A. No, I don't have an estimate. 18 Q. Is it, like, 10? Is it 100? 19 A. I mentioned a couple of them 20 earlier today. 21 Q. Okay. Okay. Can you name a 22 couple of them for me? 23 A. I mentioned, for instance, the 24 WMR fix 4. I think I mentioned the ECB 25 fix.</p>	<p style="text-align: right;">Page 316</p> <p>1 Q. And that's correct? 2 Does the WM/Reuters benchmark 3 have other fixing windows? 4 A. As we mentioned here, we will 5 try to, you know -- for purposes of the -- 6 so if you read this sentence, we will try 7 to remove the fix, fixed rates. 8 Q. Right. I just wanted to -- just 9 if you could answer my question. 10 Do you know whether the 11 WM/Reuters benchmark has other fixing 12 windows? 13 A. I don't remember all the fixes. 14 Q. But just for that one in 15 particular, do you know if there are other 16 windows? 17 A. I don't remember at the moment. 18 Q. Okay. Did you exclude data from 19 other WM/Reuters windows from your 20 analysis? 21 A. As mentioned here, the plan is 22 to get rid of the fixed rates. 23 Q. Right. I know that's the plan. 24 I just want to understand what 25 was included in your data for this report.</p>
<p style="text-align: right;">Page 315</p> <p>1 Q. Right. And we can look at the 2 class definitions that plaintiffs are 3 seeking to certify at paragraph 2 of your 4 report. They are included for ease of 5 reference. 6 But is it correct that the 7 definitions of both the OTC and the 8 exchanged classes exclude trades whose 9 prices were set on the basis of a 10 benchmark rate, such as the WM Reuters 11 closing spot rates or the ECB reference 12 rates? 13 MR. HAUSFELD: We'll stipulate 14 to that. Next question. 15 Q. Okay. If you flip back to 16 paragraph 128 of your report. You state 17 that counsel instructed you to remove 18 transaction data at the WM Reuters 4 p.m. 19 fix; is that right? 20 A. I can read from paragraph 128. 21 "As instructed by counsel, we have removed 22 transactions data at the WM/Reuters 4 p.m. 23 fix." 24 Q. Okay. 25 A. That's correct.</p>	<p style="text-align: right;">Page 317</p> <p>1 A. It's -- if you read 2 paragraph 128, "As instructed by counsel, 3 we have removed transaction data at the 4 WM/Reuters 4 p.m. fix." So this is 5 ongoing work. It will be -- those type of 6 fixed rates will be removed. 7 Q. Okay. So the only fix trade 8 that you removed for was WM/Reuters at 9 4 p.m.; is that right? 10 A. At the moment, those trades have 11 been removed. That's correct. 12 Q. Right. So this report and 13 that's it. That's the only fixing trades. 14 A. The plan is to remove other fix 15 trades as well. 16 Q. Right. But I'm just talking 17 about this report, only 4 p.m. Reuters; 18 right? Okay. Okay. 19 MR. HAUSFELD: You have to 20 answer. Did you get an answer? You 21 have to say yes or no to that. 22 A. To -- 23 MR. HAUSFELD: The question is 24 whether or not this report just 25 removed the 4 p.m. fix.</p>

<p style="text-align: right;">Page 318</p> <p>1 A. Whether this report -- it's -- 2 as mentioned here in paragraph 128, "As 3 instructed by counsel, we have removed 4 transaction data at the WM/Reuters 4 p.m. 5 fix." 6 Q. Right. And my question was is 7 that the only fix trade that you removed 8 for and the dataset that you relied on for 9 this report? 10 I understand your plan in the 11 future is different. But the only fix 12 trade removed here is the 4 p.m. 13 WM/Reuters. 14 A. As you can also read from the 15 next sentence in that paragraph, "To the 16 extent possible, trades at other benchmark 17 fixes during trading day will also be 18 removed"; right? So it's all -- 19 Q. Okay. Okay. I'm understanding 20 that -- I'm understanding -- I don't 21 know -- it's not -- it seems like the only 22 thing you removed from this dataset is the 23 4 p.m. fix with the plan to remove 24 everything else later. 25 A. Yes. Of course.</p>	<p style="text-align: right;">Page 320</p> <p>1 Q. Okay. Do you think that you'll 2 eventually be able to get rid of all of 3 them from the dataset? 4 A. There are continuous refinements 5 of the dataset. 6 Q. Okay. 7 A. So let's see. 8 Q. Okay. If you are not able to 9 remove trades at other benchmark fixes, 10 does that mean your model includes 11 transactions that are excluded from the 12 class definitions? 13 A. If you are not able to exclude 14 all of them, you mean? Well, then they 15 will certainly be in the dataset, of 16 course. 17 Q. Okay. Thanks. 18 Okay. Now if we turn to 19 paragraph 135. You write that "As of the 20 date of this declaration, trade data for 21 FX exchange traded instruments have not 22 yet been made available to us"; is that 23 right? 24 A. That is correct. 25 Q. So you have not applied your</p>
<p style="text-align: right;">Page 319</p> <p>1 Q. Okay. 2 A. So -- 3 Q. Okay. That's great. 4 So -- and just touching on that, 5 you write -- you do write, as you've read 6 a couple of times now, "For purposes of 7 the merits phase of the case, we will 8 remove, to the extent possible, trades at 9 other benchmark fixes during the trading 10 day, such as the ECB fix"; is that right? 11 A. The sentence is -- 12 Q. Right. 13 A. -- correct. 14 Q. So what do you mean by "to the 15 extent possible"? 16 A. You know, we need to identify 17 those trades. So that's ongoing work to 18 identify those trades. And when 19 identified, they can be removed. Those 20 trades cannot be removed before they are 21 identified. 22 Q. Okay. And is it difficult to 23 identify those trades? 24 A. Sometimes it is difficult to 25 identify such trades.</p>	<p style="text-align: right;">Page 321</p> <p>1 model to data for exchanged traded FX 2 instruments. 3 A. It's impossible to apply the 4 model to data that we do not have access 5 to. 6 Q. Right. Right. Okay. And at 7 paragraph 137, you write, "Based on the 8 characteristics of exchange traded 9 instruments and the ways they are traded, 10 your model of how defendants conduct 11 caused spreads to widen would be equally 12 applicable to such instruments"; is that 13 right? 14 A. That's -- you read the sentence. 15 Q. Okay. What characteristics are 16 those? 17 A. Actually, we would apply -- we 18 would apply the current model to those 19 trades as well. 20 Q. Right. But you write here, 21 "Based on the characteristics of exchange 22 traded instruments and the ways they are 23 traded, the model will be equally 24 applicable." 25 So I just want to understand</p>

<p style="text-align: right;">Page 322</p> <p>1 what those characteristics are and what 2 the ways they are traded are. 3 A. It's just what it said; right? 4 Based on the characteristics. So they 5 would use a similar model. 6 Q. Right. But can you identify 7 some of the characteristics of those 8 instruments that make them -- 9 A. For those instruments -- 10 Q. -- make the model applicable? 11 A. -- you know, for instance, 12 volatility, et cetera, will be relevant. 13 Q. Okay. And what about the ways 14 in which they are traded? 15 A. On the exchange, you mean, or -- 16 Q. I don't know. What did you 17 mean? 18 A. What's the question? 19 Q. You wrote here "based on the 20 characteristics and the ways they are 21 traded." 22 A. Yeah. We have discussed those 23 characteristics before. So -- 24 Q. Right. The characteristics 25 you --</p>	<p style="text-align: right;">Page 324</p> <p>1 what we can get. 2 Q. Right. Right. Okay. And I 3 guess that kind of answers my next 4 question, but I'll ask just to be clear. 5 How can you assess reliability 6 if you have not done any testing with this 7 dataset? 8 A. Of course, we need to do 9 analysis on the data first. I think we 10 also stated that somewhere in the 11 document. 12 Q. Okay. Because also at the end 13 of paragraph 137, you write, "Our model 14 will then be able to reliably assess the 15 percentage of exchange class as separate 16 injury as well as to calculate aggregate 17 damages." 18 A. Yeah. 19 Q. So how can you -- how can you 20 know that if you haven't seen the data? 21 A. We are not concluding any 22 results from that analysis. We are saying 23 that when we have the data, we can do the 24 analysis. So we have not concluded 25 anything.</p>
<p style="text-align: right;">Page 323</p> <p>1 A. You mean some particular 2 characteristics of the -- 3 Q. Of the exchange traded 4 instruments. Yes. 5 A. Is that what it says? I think 6 it's referring to based on the 7 characteristics of exchange traded 8 instruments and the ways they are traded. 9 What we are talking about here is to apply 10 the same model on those trades. 11 Q. Right. And we're just trying to 12 understand why you think you can. 13 A. Why? 14 Q. Right. You say "based on 15 characteristics and ways they're traded." 16 So just if you can explain what 17 that means. 18 A. I think the final analysis will 19 be performed when we have the data. Of 20 course, it's hard to tell exactly how that 21 analysis will be run before we actually 22 have access to the data. 23 Q. Of course. That makes sense. 24 A. So it's -- you know, that's 25 always the case; right? You need to see</p>	<p style="text-align: right;">Page 325</p> <p>1 Q. Okay. 2 A. And we cannot, because we do not 3 have the data. 4 Q. And if you do not get access to 5 the data, will you be able to calculate 6 impact or damages for FX exchange traded 7 instruments? 8 A. In the hypothetical case where 9 we do not get access to data, we cannot 10 run our model -- 11 Q. Okay. 12 A. -- on those data. 13 Q. Okay. Okay. If you turn to 14 paragraph 119. It starts on page 39, but 15 I'm going to focus on what's on page 40. 16 But please feel free to read the whole 17 paragraph. 18 A. Which paragraph are you talking 19 about? 20 Q. 119. 21 A. 119. 22 (Witness perusing document.) 23 Q. Okay. So in that paragraph, you 24 state that your regression model here is 25 based on a 2017 paper that you coauthored;</p>